

IEEE1394 : Promises and Challenges in Mobile Platforms and Instantly-Available PCs

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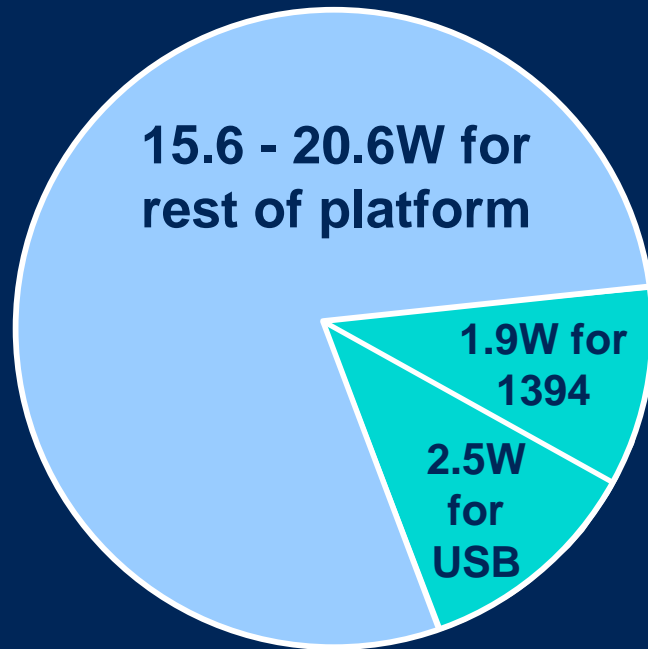
Mobile Technology Lab

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IEEE 1394 Serial-Bus Power in Mobile Platforms and Instantly-Available PCs

System Power Budget

Max. Operating Power: 20-25W total



- ◆ Assumes conservative 1394 use (2 S400 ports)
- ◆ Assumes 1 hi-pwr USB port
- ◆ Does not include cable power for USB or 1394

- ⇒ Without power management, ~20% of total power budget is used by USB and 1394!
- ⇒ USB+1394 use 10-20mw of total 50-100mW platform suspend budget

1394 PHY & Link Models

PHY power model (Watts):

S400:

@ 3.3v: $0.4 + 0.10n$



S800:

@ 3.3v: $0.8 + 0.30n$



Link power model (Watts):

S400:

@ 3.3v: 0.60

@ 2.5v: 0.35



S800:

@ 3.3v: 1.20

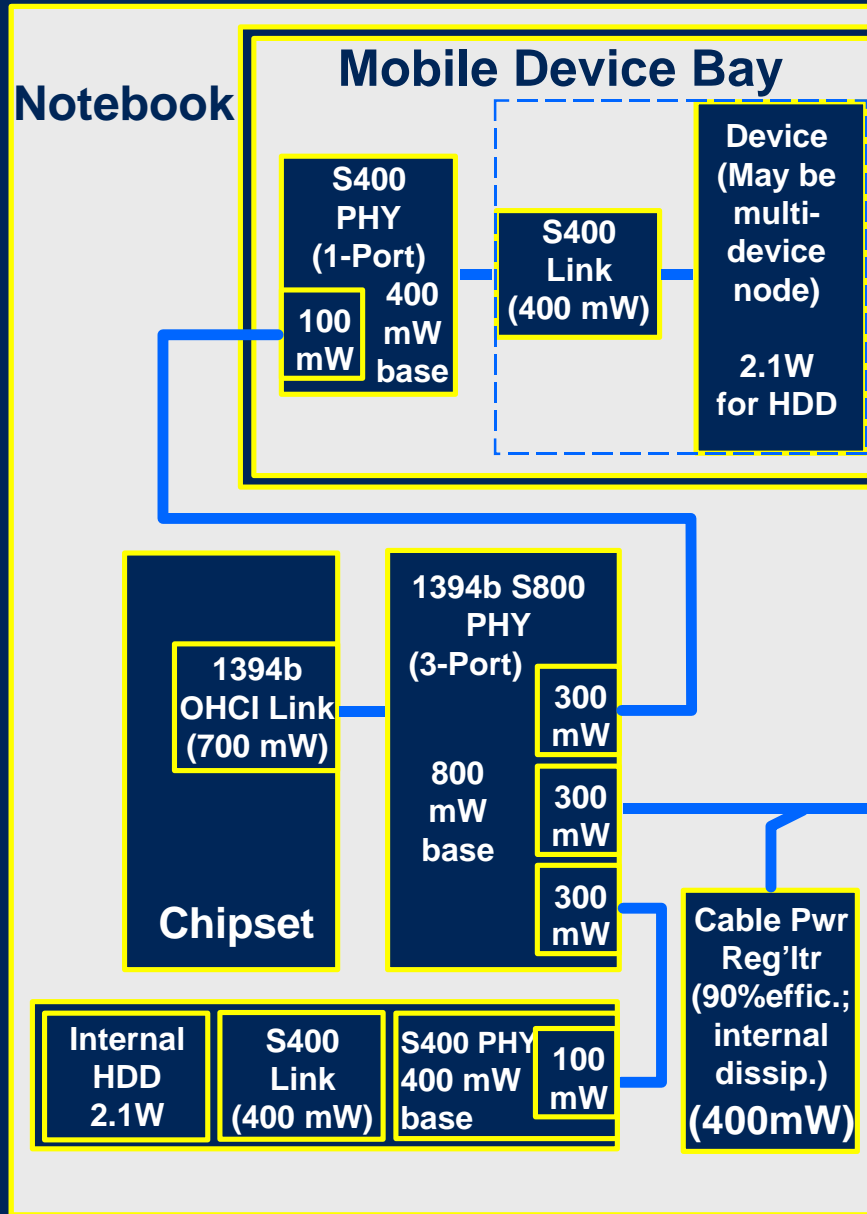
@ 2.5v: 0.70



Notes:

- n is number of ports on PHY.
- Some of the preceding models may not be achievable, due to technology constraints (e.g. probable inability to voltage-scale PHY below 3.3v). These entries are shaded.

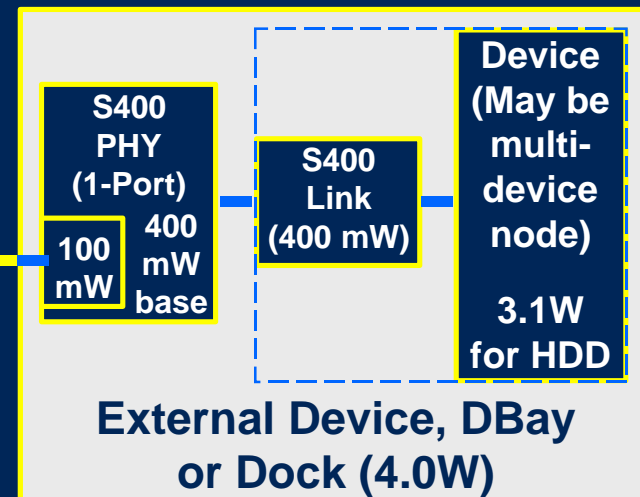
Non-Viable S800 Usage in Mobile PCs



Internal Power Dissipation

Internal 1394 I/F Power:
4.2W + 400mW » 4.6W!

Total platform internal power budget: 20-25W



(External connector; cable-power to external device)

External Power Dissipation

Taming 1394 Power

Constrain applications

- ◆ Reduce number of internal devices
(look at costs vs benefits of each application)
- ◆ Minimize cable-power costs
(e.g. alternate power provider @ 3W)
- ◆ Match speed & #ports to application needs
(e.g. S400 for mobile HDD vs S800+ for docking)

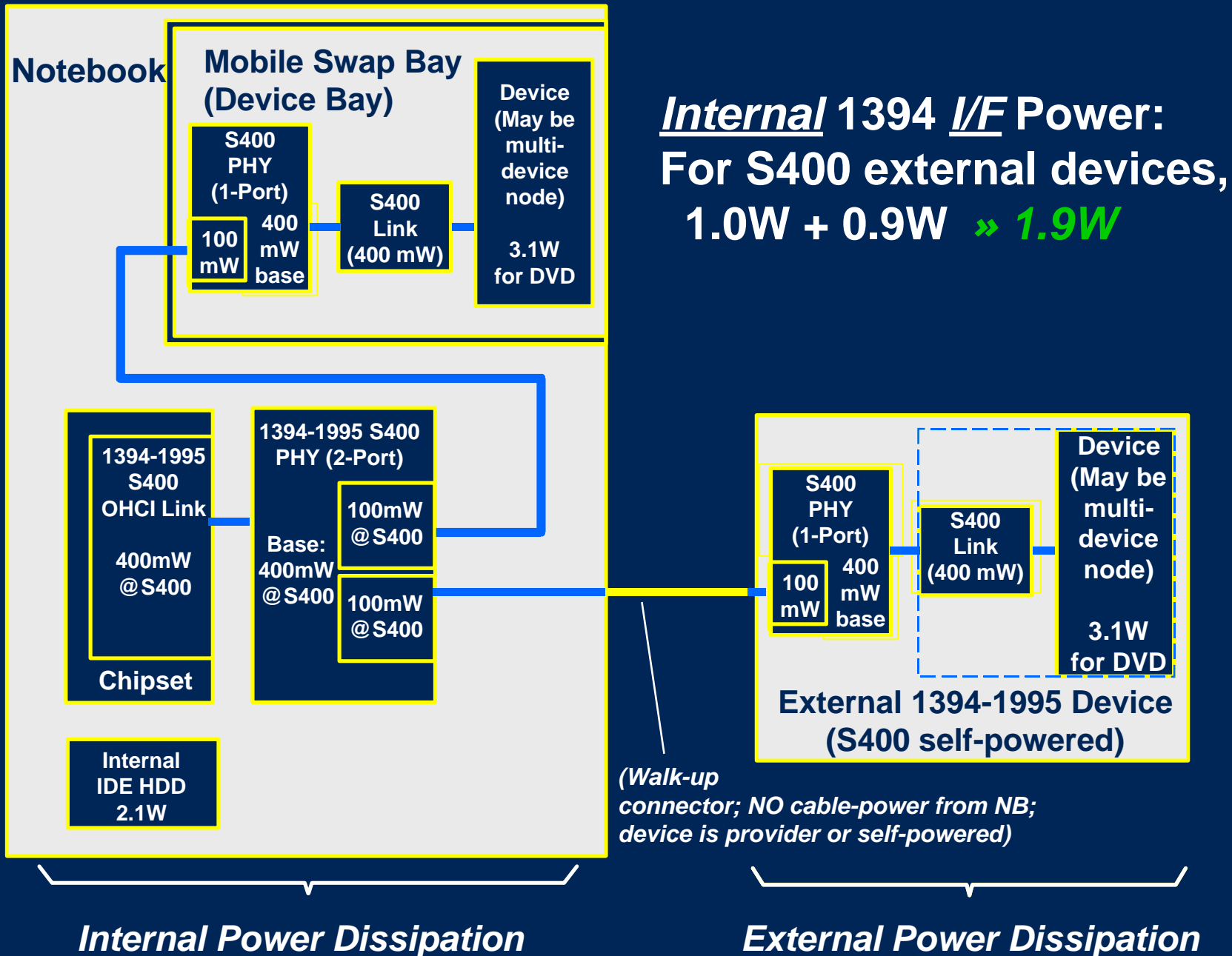
Control Bus Power Usage

- ◆ Suspend or disable idle ports (*policy?*)
- ◆ Control (break or budget for) power through inactive ports

Improve implementation power efficiency

- ◆ IC process improvements
- ◆ IC design for power conservation (digital, analog)

“Minimalist” m1394– S400



1394 Power Management

What is “Power-Friendly” 1394?

Desired behavior & capabilities:

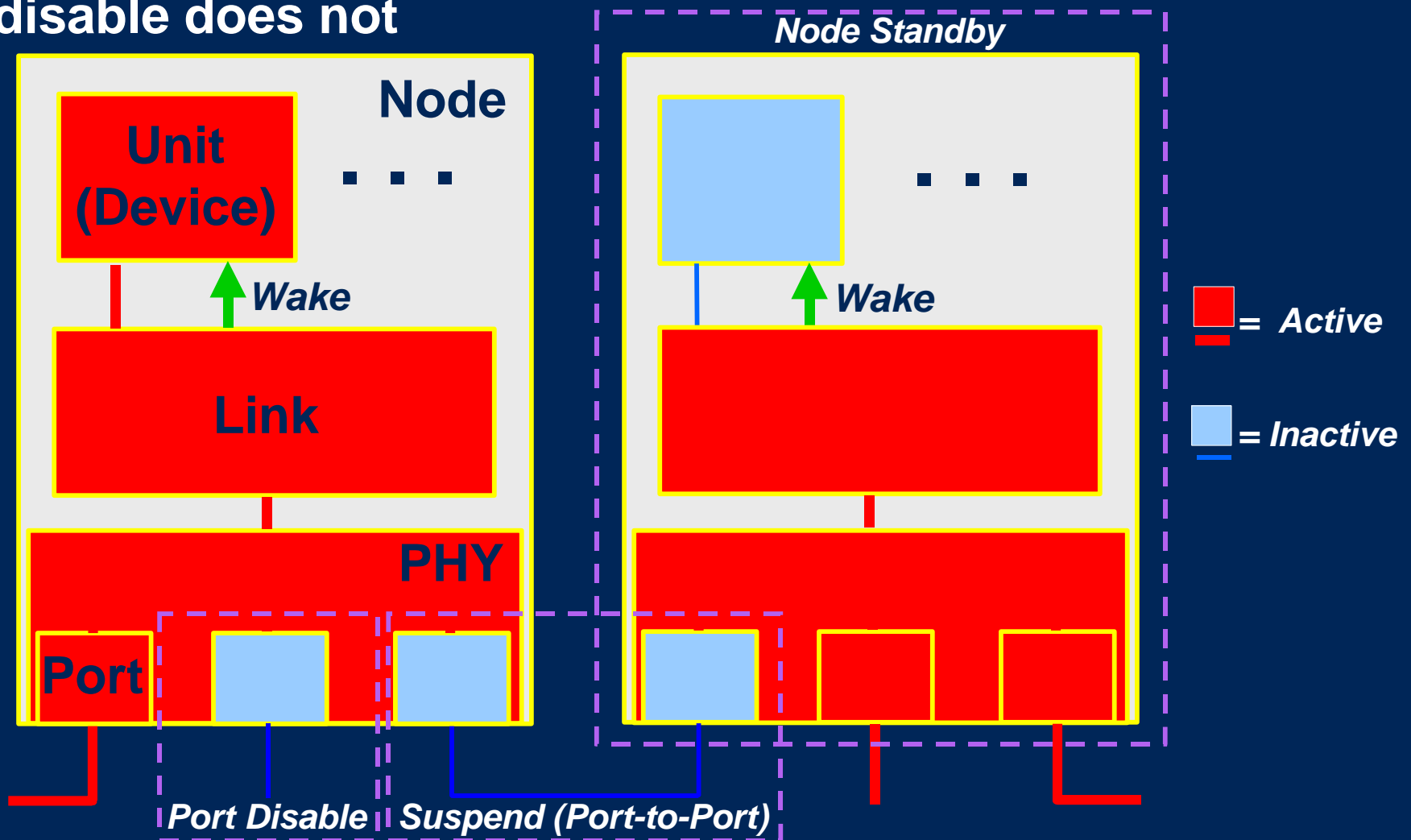
- ◆ Modest PHY-layer dissipation ($\leq 1\text{W}$)
- ◆ Fine-grain power allocation (e.g. 0.1W steps)
- ◆ Per-port enable/disable
- ◆ Low-power PHY suspend
- ◆ Support wake-event propagation during suspend
- ◆ Gentle power-on during resume
- ◆ Low node power while retaining bus integrity (“Standby”)
- ◆ Modest cable power (e.g. $\leq 3\text{W}$ @ $5-3.3\text{v}$)
- ◆ Control over cable power distribution, sourcing

Complementary software support:

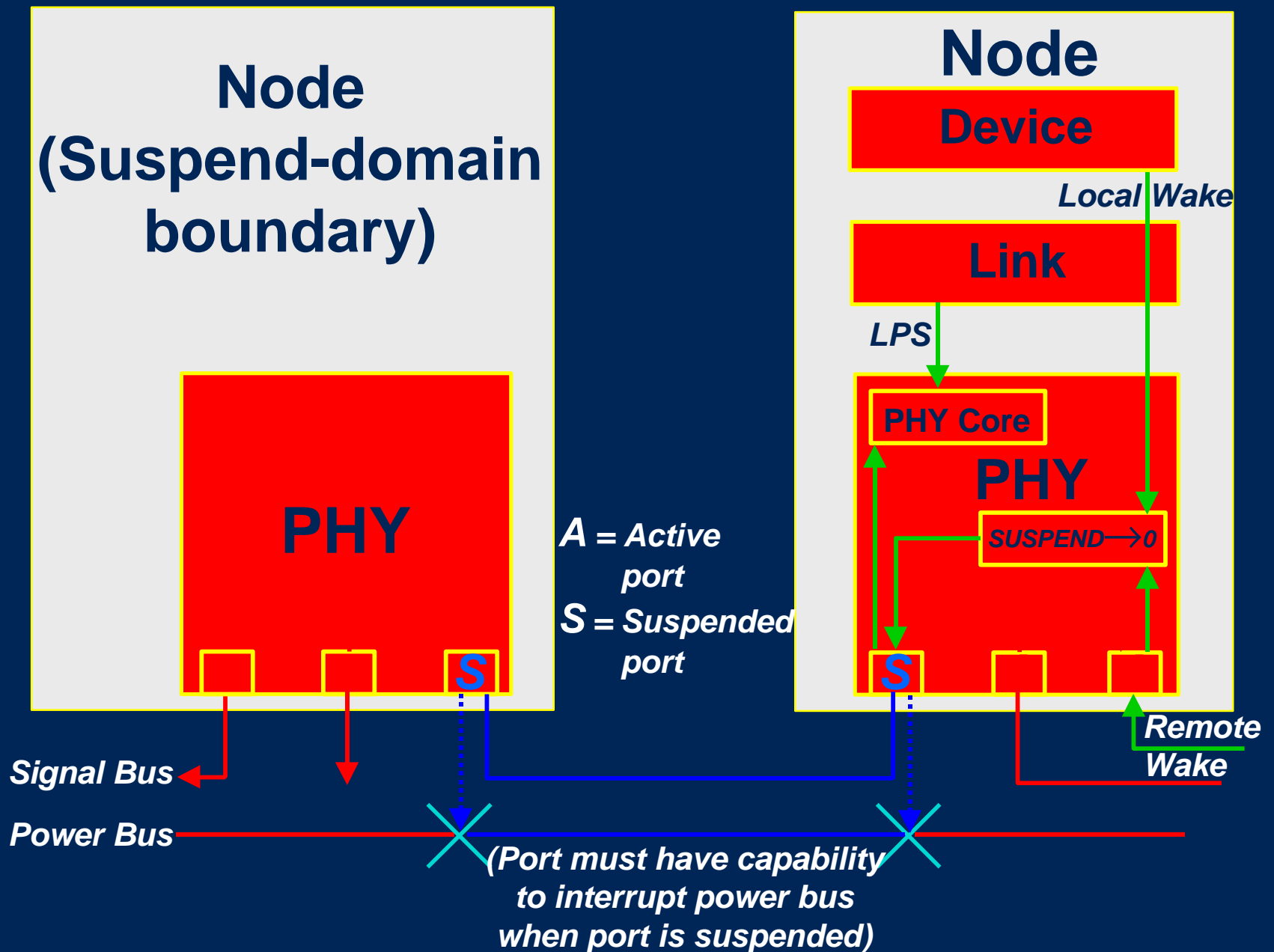
- ◆ Sophisticated, aggressive OS PM
- ◆ Supportive ACPI definitions

1394 Power Management

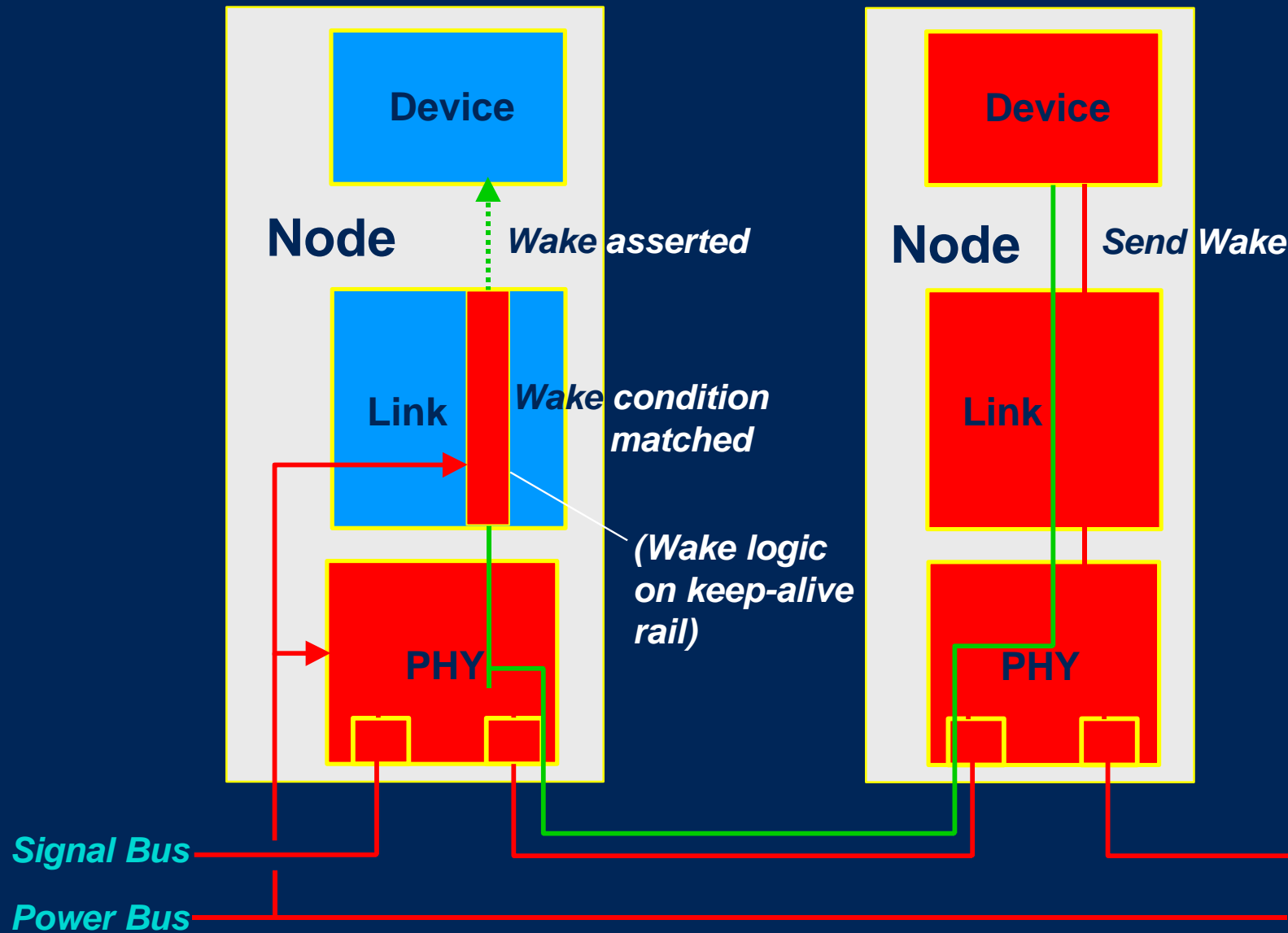
- ◆ PM includes cable power distribution, pwr-state mgmnt
- ◆ 1394 power states: PHY port, PHY overall, link, node
- ◆ Suspend detects status change, passes reset & resume; disable does not



Suspend/Resume



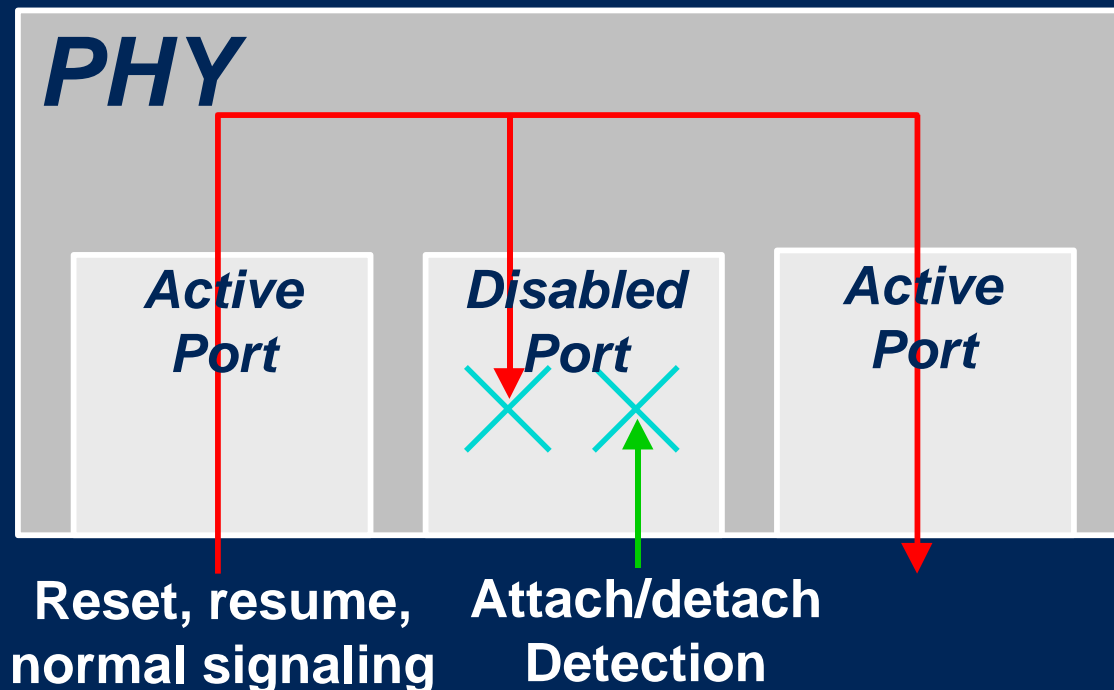
Standby



Per-Port Disable

Used to “cut off” bus branches

- ◆ Loop breaking, misbehaving devices
- ◆ Don't propagate reset, resume
- ◆ Don't detect attach or detach
- ◆ Use to create suspend “domains”



Recommendations and Call to Action

1394 PM Beyond '98

Desktop 1394 expected to ramp in 98+

- ◆ Multiple PHY, link, chipset vendors
- ◆ Base of 1394 devices will grow (types, volume)
- ◆ 1394a and 1394b standards enhance 1394-1995
- ◆ 1394 will spread to mobile

1394 power control will improve

- ◆ 1394a adds suspend/resume, port disable
 - ◆ 1394 TA Power-State Management, Cable-Power Distribution and Suspend/Resume draft specs
 - ◆ 1394 TA Power Management WG activities (e.g. Standby implementation)
 - ◆ Silicon process improvements
- but*
- ◆ 1394b S800+ speeds will renew challenge

Mobile 1394 Call to Action

Know the issues in doing "power-friendly"
1394 implementations

- ◆ Do power and cost/benefits analyses to guide #ports, cable-power capability, etc.

Implement 1394 **power management**

- ◆ Understand and apply 1394a PM mechanisms and 1394 Trade Association's specifications on Cable-Power Distribution, Power-State Management and Suspend/Resume
- ◆ Participate in enabling mobile 1394:
 - ⇒ Committees (TA PMWG, 1394b)
 - ⇒ Push for aggressive PM in system software (OS)
 - ⇒ Drive for PM in both 1394 devices and hosts

1394 PM Forums & Resources

Forums

- ◆ 1394a WG ➤ Folding S/R into spec (spec closure 1Q98)
- ◆ 1394b WG ➤ Work on bus startup, S/R
- ◆ 1394 TA ➤ PMWG (TF of Architecture WG)

Resources

- ◆ PMWG reflector, Web & FTP site ➤ <http://www.p1394pm.org>,
<ftp://ftp.p1394pm.org/pub/p1394pm/>
(sign-up: Steve Bard @ Intel, (503)264-2923)
- ◆ 1394 TA Web site ➤ <http://firewire.org/>
- ◆ 1394a WG reflector (member co's only) ➤ http://firewire.org/members/priv/001/specifications/mo_specs.html